

HARRIER

COMBAT SIMULATOR



MINDSCAPE INC.

HARRIER

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GETTING STARTED



Follow the instructions listed on the Reference Card for loading the program. Information on saving games and game control is also listed on the Reference Card.

Your Mission

All hell broke loose last night. A group of saboteurs infiltrated a U.S. Marine Base in North Africa and destroyed the entire squadron of Harrier jet fighters—well, almost. In their haste to complete their mission and escape, the terrorists overlooked one Harrier in the hangar. This jet fighter was being outfitted with FOFTRAC, a top-secret, experimental tracking device. There was no time to outfit the Harrier with an ejection system; so you have one, and only one, chance to successfully complete your mission.

Based on intelligence reports, the strike was organized and directed from the terrorists' headquarters—500 miles away in a neighboring country. Because the neighboring country is known to be sympathetic to the terrorists' cause, it's likely that any acts of retaliation will be met with strong ground and air resistance. Your mission is to penetrate enemy territory and destroy the terrorists' headquarters. Failure to complete the mission might mean losing the entire Sixth Fleet on station in the Mediterranean.

Four mobile ground units will aid you in your mission. Move your ground sites progressively toward enemy headquarters, keeping them within range for refueling and rearming. If a ground site falls under attack, destroy the enemy forces and set up a new ground site. The fighting will become more intense as you approach the terrorists' base. Your one big advantage is the Harrier jet's excellent maneuverability.

The Harrier

Tailored for the mission that awaits you, the Harrier's design is suited for tactical attack maneuvers and reconnaissance flights. Your Harrier has also been outfitted with certain top-secret systems to help you outsmart the enemy. The instrument display is ideally designed to provide pertinent flight and target information without impairing the pilot's view ahead. Sophisticated radar and tracking devices are highly sensitive, giving the pilot detailed information on the enemy's status.

What sets the Harrier apart from other combat aircraft is its ability to change engine thrust from conventional horizontal thrust to vertical thrust. This provides its renowned ability to perform Vertical/Short Take Off and Landing (V/STOL). V/STOL enables the Harrier to operate from small, difficult-to-detect landing sites close to the line of battle, enabling it to respond quickly to a need for ground support.

In air-to-air combat, the ability to instantly change the direction of air thrust allows the aircraft to decelerate rapidly, which in certain circumstances can be a considerable asset. Known as VIFFing (Vector in Forward Flight), this technique is a major factor in the aircraft's combat success. See the sections entitled "Flying Your Harrier" for details on performing these maneuvers.



THE MAIN MENU

Menu Selection

Commodore Use your joystick to highlight the options you wish to select; then press the fire button.

Atari Use your mouse to position the Harrier Combat Simulator cursor over the options you wish to select; then click the left mouse button. After you have made your selections, move the cursor over **O.K.** and click the left mouse button again. Enter your name when prompted, then press **RETURN**.

Amiga Use your mouse to position the Harrier Combat Simulator cursor over the options you wish to select; then click the left mouse button. After you have made each of your selections, move the cursor over **O.K.** and click the left mouse button again. Enter your name when prompted, then press **RETURN**.

IBM Use your joystick or the cursor keys to highlight the options you wish to select; then press the **ENTER** key on the keyboard or the fire button on the joystick to start your mission.

Mode of Play

Demo The Demo mode allows you to watch how the Harrier maneuvers in flight and in combat. When the Demo sequence ends, it will automatically start over again.

Practice The Practice mode allows you to practice flying the Harrier without risk of enemy attack. You will not be able to carry out your mission in the Practice mode.

Combat Practice The Combat Practice mode allows you to practice combat techniques without worrying about enemy retaliation. You will be able to score points for successful attacks against the enemy. However, you are not able to complete your mission.

Combat When you are ready to carry out your mission, select the Combat mode.

IBM Users In place of **Demo**, the IBM version has **Produce Demo** and **Show Demo**. These two features allow the user to record and play back his/her own demo. To do this, simply choose Produce Demo and play the game as you would normally. To play back your demo, select Show Demo. There is also the additional menu item, **Mission**, which provides the player with instructions on how to complete a special mission.

After selecting **Mission**, a menu of sample missions will appear. Select the name of the mission you would like to try. The computer will monitor your progress and notify you when you have successfully completed your mission.

Levels of Difficulty

After selecting a play mode, you may choose from 3 levels of flying difficulty: **Pilot**, **Commander** and **Ace**. The Demo mode does not require selection of a difficulty level.

Pilot This is the basic level, and is recommended for the first few missions.

Commander At this level you will begin to encounter the effects of G forces. If you climb too quickly, you will black out (from the blood rushing away from your head) at 9G positive. If you dive too steeply, you will red out (from blood rushing to your head) at 3G negative. Fuel consumption must be monitored carefully at the Commander level as your Harrier burns more fuel than in the Pilot level.

Ace In addition to the factors encountered as a Commander, this level requires greater accuracy in aiming and firing the cannon, as the cannon's range is reduced.

INSTRUMENTS AND SCREEN DISPLAYS



Since the controls and flight features are complex and require skill to operate, it would be wise to familiarize yourself with the Harrier's screen displays and instruments before takeoff. A diagram of the instruments and screen displays is shown on the Reference Card.

HUD (Heads-Up Display)

Superimposed on the canopy of your fighter is the HUD, which provides vital in-flight information. From left to right, the displays are:

VSI	Vertical Speed Indicator. Shows whether you are climbing or descending. Useful for guiding your jet while hovering.
ASI	Air Speed Indicator. Shows your forward speed through the air. The scale is marked in increments of 50 knots, with a major marking every 100 knots.
Compass	Shows your compass heading from 0° (straight north) through 359°.
Sight	Acts as both a gunsight and a roll indicator, showing the position of your wings relative to the horizon.
Altitude	Altitude measured in feet above ground level.
Pitch	The angle of your plane in relationship to the ground. Positive values indicate a climb, negative values indicate a dive.

Additional information can be displayed on the HUD by pressing the following keys.

- | | |
|---|--|
| 7 | Bomb Sight Shows the direction and projected point of impact (indicated by the small horizontal line) if a bomb is released. Note that the impact point will not be displayed if the line is at 12 o'clock. To launch a bomb, press the fire button after selecting the bomb sight. |
| 8 | Homer When you are in the air, press 8 followed by the letter of the landing site you wish to locate, Q, W, E, or R. If you are |

heading toward a site, a long vertical line will appear on the HUD. A short line indicates that you are heading away from that site—change course until the line becomes long and vertical. If you are too far away from a landing site, the Homer will not work and no line will appear on the HUD.

- 9 **Missile Sight** Displays a line indicating which enemy plane your sidewinder missile has targeted. This is very helpful when there are multiple targets, and you want to know which target has been sighted. To launch a missile, press the fire button after selecting the missile sight.
- 0 **Standard Display** Clears the bomb, missile or Homer sights from the screen and restores the standard HUD.

Instrument Panel	The Instrument Panel is located in the lower part of the screen. The panel provides information on flight and weapons status, as well as maps, target radars, and messages and warnings.
MFD	(Multi-Function Display) The MFD displays information about flight status.
Thrust Level	Displays the amount of thrust or power currently used. Press P to increase thrust and press O to decrease thrust.
Fuel Supply	Displays the amount of fuel remaining (a full tank will last about 20 minutes at maximum thrust). You can refuel at ground sites.
Undercarriage	Displays landing gear status: Commodore —green for down, red for up. Atari, Amiga and IBM —white for down, red for up. After takeoffs, landing gear must be up. Just before landing, gear must be down. Press U to engage landing gear.
Brakes	Commodore —green for off, red for on. Atari, Amiga and IBM —white for off, red for on. Use brakes only when landing. Press B to engage brakes.

Flaps **Commodore**—green for deployed, red for up.
Atari, Amiga and IBM—white for deployed, red for up.

Take the flaps up shortly after takeoff. Bring the flaps down as you are about to land. Press F to engage flaps.

Thrust Vector The Thrust Vector shows the direction of the jet's thrust. There are three thrust directions: **horizontal** (used in conventional takeoffs and while in the air), **vertical** (used in vertical takeoffs and landings, and in complex maneuvers) and **45°** (used in short takeoffs and landings, and in certain maneuvers). To change the thrust direction, press **3** for vertical, **4** for 45°, and **5** for horizontal.

AAR
(Air Attack Radar) The AAR is located in the lower right corner of the screen. It indicates the position of enemy aircraft, AAMs (Air-to-Air Missiles) and SAMs (Surface-to-Air Missiles) within a radius of 5 miles and within an altitude band of plus or minus 5000 ft. The scale on the left indicates the altitude of approaching missiles in relationship to your craft. The scale on the right indicates the altitude of the enemy aircraft. This display will also provide information on your weapons status. Press **1** to toggle between AAR and weapons display. A picture of your plane will appear with the number of bombs and missiles remaining.

At takeoff, weapons inventory is as follows:

- 2 Sidewinder AIM-9L Air-to-Air Missiles (AAMs)**
With a 5-mile range, these infra-red missiles are most effective in close range attacks.
- 3 1,000-lb. Bombs** These powerful bombs are used for destroying the enemy's ground forces.
- 9 Flares** Use flares to divert the enemy's infra-red missiles.
- 9 Chaff Packs** Chaff packs disperse a cloud of metal particles designed to reflect the enemy's radar, making it impossible for the enemy to lock on to your position. Use them also to divert radar-controlled missiles.
- 250 Rounds of Cannon Shell** This ammunition has a 2-mile range and is used in close fighting.

**FOFTRAC
(Friend or Foe
Tracking Radar)**

The FOFTRAC is located in the center of the instrument panel. This is both a map and target display of your area of operation representing an area of approximately 24 miles by 12 miles (one square on the map grid). The following information is shown:

	Commodore	Atari, Amiga and IBM
Mountains	Peaks	Peaks
Your ground sites	Flashing white dots	Flashing towers
Your track	Trail of white dots	Trail of white dots
Enemy ground sites	Red dots	Small pictures of gun towers
Tanks and their tracks	Moving red lines	Small pictures of tanks
Enemy aircraft and missiles	Moving red dots	Moving red dots

As FOFTRAC is continuously updating the display with flashing moving targets, you can use it to track enemy movements and plan your tactics. To clear your FOFTRAC of invalid tracks, press **6**. The message screen will also show the grid coordinates of the area (as noted on the map grid).

Note When you fly into a new combat area with no ground sites, FOFTRAC will no longer show ground targets. To gather the information necessary for FOFTRAC to function, you must perform a reconnaissance flight at about 16,000 ft. to the center of the target area (marked by a white dot). At this point, your wing cameras will photograph the area and the FOFTRAC display will begin to operate.

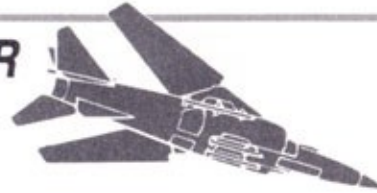
Message Display

The Message Display is located above the thrust and fuel indicators. During your mission, appropriate messages, location notices and warnings will be displayed in the message panel.

**Atari, Amiga and
IBM Features**

In addition to the features listed above, the Atari, Amiga and IBM versions also include two extra displays on the instrument panel. On the left side of the panel there is a **Landing Site Indicator** which displays the letter of the landing site chosen (Q, W, E, or R). On the right side of the panel is a **Damage Indicator**, which displays the degree of damage sustained.

FLYING YOUR HARRIER



Because of the Harrier's unique ability to hover and to change the direction of thrust, it can maneuver in and out of tight situations and take off and land in small areas. Your mission will require many takeoffs and landings while setting up ground sites. By taking full advantage of the Harrier's technical features, you will be able to outmaneuver the enemy.

Before taking off, look at the map grid on the Reference Card and plan your strategy. Keep the map handy to find your location in relationship to your ground sites and the enemy's headquarters. You might want to make a copy of the map to mark the location of the Harrier and ground sites during your mission. This will help you complete your mission and fly more effectively.

Direction

Moving the joystick (or using the keyboard equivalents) left or right will cause the jet to bank in that direction. The roll indicator displays the jet's position relative to the horizon. You can also change direction while hovering by moving the rudder to the left or right. Do not use the rudder while flying as the Harrier will maneuver poorly.

The compass shows the direction heading in degrees. Due North is 0°; East is 90°; South is 180°; and West is 270°. Once you are in the air, make sure that you are headed in the proper direction. The enemy's HQ is at North-East, or at a heading of approximately 45°.

Operational Areas

Your starting location is in the **AA** operational area (refer to the map grid). The enemy's headquarters are located in the **P£** operational area in the north-northeast. Upon leaving an operational area, the message screen will display the new area's coordinates. If you enter an operational area where there is no ground site, perform a reconnaissance mission to check for enemy ground forces and to find suitable ground site locations.

If You Are Lost

If you fly out of the operational areas, you will receive a "FOFTRAC WEAK" message. To get back into operational areas, fly at a heading of 45°. If you are lost within the operational areas, the message screen periodically displays the coordinates of your location.

Taking Off

The designated landing sites in this simulation are shown as prepared areas with beacons at the four corners. Each site is just long enough for a conventional takeoff or landing, but it is advisable to use V/STOL (Vertical/Short Take Off and Landing) techniques in these tight areas.

Note Shortly after takeoff, make sure the flaps and landing gear are up after you are in the air. To give the Harrier more lift, keep the flaps down during takeoff. Once in the air, level the Harrier by bringing in the flaps. If the landing gear is still down after takeoff, the Harrier will vibrate and give you a warning that you are flying too slowly.

1. Conventional Takeoff

- A. Power up to 80% by pressing the **P** key until the Thrust Indicator reaches 80%. (If you are using an Atari and are having difficulty with takeoffs, reduce the amount of thrust to 50%.)
- B. At 125 knots (the ASI should be just above the second mark), lift off by easing back on the joystick.
- C. Raise the gear by pressing the **U** key. Bring the flaps in by pressing the **F** key.
- D. Reduce power gradually by pressing the **O** key.

2. Short Takeoff

- A. Power up to 80%. (If you are using an Atari and are having difficulty with takeoffs, reduce the amount of thrust to around 50%.)
- B. Press the **4** key to select 45° thrust.
- C. At 100 knots, lift off by easing back on the joystick.
- D. Raise the gear by pressing the **U** key. Bring the flaps in by pressing the **F** key. Reduce power as necessary.
- E. Fly at a pitch of less than +10°.
- F. At 150 knots, press the **5** key to select horizontal thrust.

3. Vertical Takeoff

- A. Press the **3** key to select vertical thrust.
- B. Power up to 100%.
- C. Raise the gear by pressing the **U** key. Bring the flaps in by pressing the **F** key. Reduce power slightly.
- D. At 700 ft., lower the nose slightly to increase forward speed.

- E. Press the **4** key to select 45° thrust and ease back to zero pitch.
- F. At 150 knots, press the **5** key to select horizontal thrust.

Hovering

After a vertical takeoff and while vertical thrust is still selected, adjust the power until the VSI reads zero and altitude is steady—at about 80% thrust. Moving the joystick forward to pitch the nose down will cause you to move forward, and moving the joystick back will reverse the effect and cause you to move backwards. The skill in hovering is achieving a balance between these two movements so there is little or no forward or backward movement. The Harrier's heading can be changed while hovering by using the rudder keys; **<** for left and **>** for right. (This is probably the only time you will ever need to use the rudder.)

VIFFing

The Harrier's **VIFFing** (Vector in Forward Flight) capabilities can also assist you in getting to a better position for fast evasion and counter attack. The objective of VIFFing is to force the attacker to fly past you. By quickly deviating from the straight line of flight (either vertically, horizontally or both), your attacker cannot respond quickly enough and flies straight ahead. Keep in mind that the enemy's jets are faster and more likely to overshoot a highly maneuverable target such as your Harrier.

The Harrier is made for VIFFing. Change the direction of thrust at appropriate times for an increase in altitude combined with dramatic decelerations. Try the same technique while banking sharply—your rate of turn will increase dramatically. Both techniques can be life-savers in a combat situation.

Important Points for Flight

Listed below are several items concerning drag and gravity to keep in mind while flying:

Climbing Speed will decrease as the aircraft climbs unless more power is added. If you try to climb too steeply with insufficient power and speed, you will stall.

Stalling A stall is indicated by a change in engine noise followed by a sudden drop in the nose of the craft. To recover, reduce power, push the joystick forward until flying speed is regained, then level out and increase power at the same time.

Diving Speed increases as the aircraft dives unless power is reduced. Diving at too great a speed will eventually cause a break-up.

Level Flight In level flight, you can increase altitude by increasing power. To maintain the new altitude, push the joystick forward to return the aircraft to straight and level flight. The reverse procedure will produce level flight at a lower altitude.

Landing

Landing is substantially more challenging than taking off. First, you must locate a suitable ground site. As detailed before, press **8** (Homer) and then the letter of the landing site you would like to locate (Q, W, E or R). If you are heading in the right direction, you will see a long vertical line on the HUD. If you are heading in the wrong direction or away from the site, you will see a short vertical line on the HUD. Change your course until you see a long vertical line. Head in the direction of the line until you see the landing site on your FOFTRAC. Remember to use the map grid to mark the locations of your ground sites.

As you approach the landing site, you will see the beacons. When you reach the center of the landing site, you will hear a high-pitched tone indicating that the optimum landing location has been reached. Any small hills in the landing site area can be ignored—they are just camouflage. Due to the short runways, it is advisable to perform either a vertical landing or a short landing. Once you have landed at a ground site, you can refuel and rearm your jet. Your jet will automatically be refueled upon landing. To rearm your jet, press the **2** key.

If you are setting up a new ground site, select a location near the mountains for good protection from the enemy's radar. However, it should not be so close to high ground that maneuverability during takeoffs and landings is impaired. As there are no runways, you *must* perform a vertical landing with *no* horizontal speed. If you do not land in this manner, the landing will be too rough and the Harrier will crash.

1. Vertical Landing

- A. Approach your proposed landing area at an altitude of 500 ft. and a vertical speed of 400 knots (remember, each mark on the VSI is 50 knots).
- B. Select 45° thrust and maintain level flight. Wait until speed decreases to 200 knots.
- C. Lower the landing gear by pressing the **U** key and the flaps by pressing the **F** key.
- D. Push the joystick forward to decrease altitude. At 200 ft. pull back on the joystick and level off.
- E. Select 90° thrust and begin to hover.
- F. Reduce power to gently lower to the ground.

2. Short Landing

- A. Approach your proposed landing area at an altitude of 500 ft. and a vertical speed of 400 knots.
- B. Select 45° thrust and maintain level flight. Wait until speed decreases to 200 knots.
- C. Lower the gear by pressing the **U** key, and the flaps by pressing the **F** key.
- D. Maintain level flight and wait until your speed falls to 120-100 knots. Keep the pitch between 0° and -6° and make sure your speed goes no lower than 100 knots.
- E. Adjust the power and pitch to keep your rate of descent at under 10 ft. per second (one notch on the VSI).
- F. Upon touchdown, cut all power and apply the brakes by pressing the **B** key.

3. Conventional Landing

A conventional landing, although possible, is extremely difficult due to the short runways available at ground sites. You will need to touch down at the extreme edge of the area and immediately cut power and apply the brakes.

SETTING UP NEW GROUND SITES

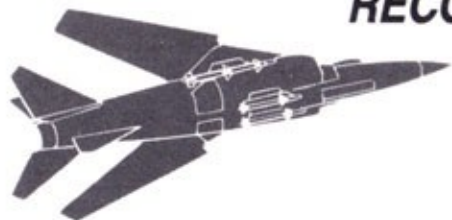


To reach the enemy HQ, you first need to destroy the enemy ground forces threatening your ground sites. When you have done this, your next move is to set up a new ground site in a neighboring operational area. The area between you and enemy HQ is divided into 512 operational areas; you may move your ground forces to any of these areas. Your objective is to move the four ground sites to strategic locations which will enable you to move closer to the enemy's HQ. When you fly into a new area, begin by making a reconnaissance flight to find an area clear of enemy forces for your new ground site. Select an area that affords enough protection from the enemy's radar, but has adequate access to landing and takeoff locations.

To set up a new ground site, you must perform a vertical landing at the new site location. After you have landed, you can call up your ground staff to move your forces to your current location. Press **8** (Homer), followed by the letter of the ground site (**Q**, **W**, **E** or **R**) to which you would like to relocate. Your forces will be automatically moved into the area by air drop at a speed of 600 knots. The farther away you relocate a ground site, the longer it will take for your forces to arrive. You cannot rearm or refuel until your forces arrive. If you still have fuel and weapons, carry out local strikes or maneuvers so that you don't leave yourself open to attacks while you are on the ground.

A high-pitched alarm sounds when the forces have been mobilized. Your forces will be able to prepare the area as a site. If you don't hear the alarm, the location you have selected is not suitable and another site will be prepared nearby. Take off and use the Homer to find the new site.

RECONNAISSANCE FLIGHTS



When flying into a new combat area, the FOFTRAC will no longer show ground targets. To gather the information necessary for the FOFTRAC to function, you must perform a reconnaissance flight at an altitude around 16,000 ft. Fly toward the center of the target area (marked by a white dot on the FOFTRAC). At this point, your wing cameras will photograph the area and the FOFTRAC display will begin to operate. If the FOFTRAC goes blank while you are still in the combat area, press **6** to update the FOFTRAC. If you leave the combat area, you must perform a reconnaissance flight again to update the FOFTRAC.



COMBAT



The Enemy Ground Defenses

The enemy tracks your movements using a ground-based radar. Often times, ground-based radars are ineffective at very low altitudes. If it is at all possible, try to come in low for attacks on the enemy's ground forces. This is a highly dangerous maneuver. However, if you can avoid the enemy's radar, your chances at a successful strike are very good. A more traditional attack involves coming in quickly from a higher altitude, dropping the bomb and executing a quick retreat. The enemy's ground defenses are:

SAM Surface-to-Air Missiles. Radar controlled, they can destroy targets above 2000 ft. They may be fully radar-guided, or may function as an infra-red homing device locked onto your exhaust.

AAA Anti-Aircraft Artillery. Usually radar-controlled, they are most often located near SAM sites.

Ground Fire Small arms fire from ground troops. Although nerve-wracking, unlikely to be harmful.

Damage caused by ground or cannon fire is indicated by the progressive failure of your instruments, until you are finally shot down. Remember that the Harrier has not been outfitted with an ejection system; you only have one chance to complete your mission.

Attacking Ground Defenses

The enemy's ground defenses are displayed on your FOFTRAC as various red dots and lines. They will appear around your ground sites and move in for the attack. As you approach the tanks and SAM sites, they will be visible on the horizon. The most effective ground attack method is to approach fast and weaving at altitudes less than 500 ft. Mountains can offer some shielding from radar, but may obscure your view of the target until the last minute. You might consider a high, observing approach, followed by a low, fast attack.

Both bombs and cannon are effective against ground forces. Bombs are relatively easy to use since the bomb sight provides a projected point of impact. To launch a bomb, press 7 and then the fire button. Normally you would fly over the target after releasing the bomb, but this can be risky. An

alternative is to perform a maneuver called **The Long Toss** (see section entitled "Offensive Moves"). This involves banking to the left or right during a rapid ascent after the bomb is launched. The cannon is riskier to use, since you need to dive straight at the target for a sure hit.

The Enemy Aircraft

Your attackers fly the MIG 23, which has supersonic capabilities. The Harrier is a subsonic fighter, but can achieve supersonic speeds while diving. The MIG has better flight characteristics above 20,000 ft., so your best bet is to engage at a lower altitude so you can fight on your own terms.

The enemy is armed with a cannon and four missiles. The missiles may be either Infrared Homing (IRH) or Radar Guided (RG). When the enemy is on your tail, cannon or IRH will most likely be the chosen weapons, as they perform best at close range. RG missiles may be fired from anywhere behind you and have a much longer range. Your opponent, when in front of you and flying away, may even fire "Fire and Forget" missiles (most likely an RG missile). Use your flares to divert infra-red missiles and chaff packs to divert radar-controlled missiles.

Attacking Air Defenses

Ideally, try to position yourself within a 30° "Lethal Cone" behind the enemy. In this position, you have a clear shot at the enemy, whether you are above or below him. It is almost impossible for the enemy to shake you off his tail. If you are in a 45° "Cone of Vulnerability," you have a good chance at hitting your target as well. However, your enemy now has the ability to out-maneuver you.

If you choose to use an AAM (Air-to-Air Missile), keep in mind that its range is 5 miles. Press **9** to see if the enemy is within range and set your sights on his craft. Then press the fire button to launch the missile. If you choose to use your cannon, the range is 2 miles and must be shot directly at the enemy. Having achieved a good position behind the enemy, you will also need to be aware of several factors:

1. **The characteristics of both your own and the enemy's craft.** The enemy's jet is much faster than yours, but you are able to maneuver and change directions quickly. Keep in mind that the Harrier can achieve higher speeds while diving.
2. **The side effects of certain maneuvers.** Your ability to turn is a function of speed. Too tight a turn at too low a speed will reduce both altitude and speed; at higher speeds, the rate of turn will be slower. Your optimum turning speed is about

450 knots. If you keep this in mind, you will be able to make quick getaways or shake off persistent enemies.

3. **The enemy's responses.** Remember that the enemy will try to force you to pass in front of him, reversing the situation instantly. Keep close on his tail and position yourself within the 30° "Lethal Cone." This will ensure that you will be able to respond quickly to the enemy's movements.

Radar Warning Receiver

Your Radar Warning Receiver (RWR) will warn you of enemy radar nearby. A sound and a message will warn you of the enemy's presence, either on the ground or in the air. Be aware that your radar coverage may be incomplete, as the radar may be blocked by parts of the Harrier or by mountains.

Should you be picked up by the enemy's radar, your craft has automatic ECM (Electronic Counter-Measures) to attempt to break the enemy's radar fix. Changing course or diving below 500 ft. will help you elude the radar. Use the Chaff Packs to confuse the enemy's radar or divert missiles.

Defense Against SAM and AAM Attack

If you are unsuccessful at evading the enemy's radar, you will have very little time to react to the enemy's certain attack. Follow some of the pointers listed below for evading or diverting missiles. If the missile explodes in the air, your evasion has been successful.

1. When the radar-lock warning sounds and appears on the message screen, try to evade the missile's lock on your position with a drastic alteration in direction with a turn greater than 90°.
2. If you cannot immediately break the lock on your position, your RWR will warn you of the type of missile launched by the enemy. Monitor its position on AAR and/or FOFTRAC. Turn toward the missile and start weaving. At the last possible moment, make a drastic change in heading.
3. An additional option is to use your flares (for IRH) or chaff packs (for RG) to divert the missiles. Set them off at the last possible moment. You are equipped with 9 dispensers of each.

Offensive and Defensive Maneuvers

The best way to become familiar with your aircraft's potential is to perform actual flying maneuvers (in Practice or Combat Practice mode, if you wish). Certain well-known offensive and defensive maneuvers are described below. You may want to try your hand at some of these techniques before entering Combat mode.

Defensive Break

This is the classic response to a rear attack, in which your attacker becomes the defender. This is a useful move if you are at a higher altitude than your enemy and he is closing in quickly. Drop your altitude quickly to force your attacker to fly past you while he is trying to lower his altitude. You should now be behind the enemy aircraft, and in good attack position. You may also try turning sharply into the direction of the attack, forcing the attacker to fly past you, leaving you to retreat easily.

Attacker about to achieve firing position

Defender turns sharply into direction of attack

The Scissors

The Scissors is a *series* of breaks, where the attacker and defender continuously trade places. You have the advantage in this maneuver, since your Harrier is much more maneuverable and your opponent's jet is faster and more likely to overshoot you.

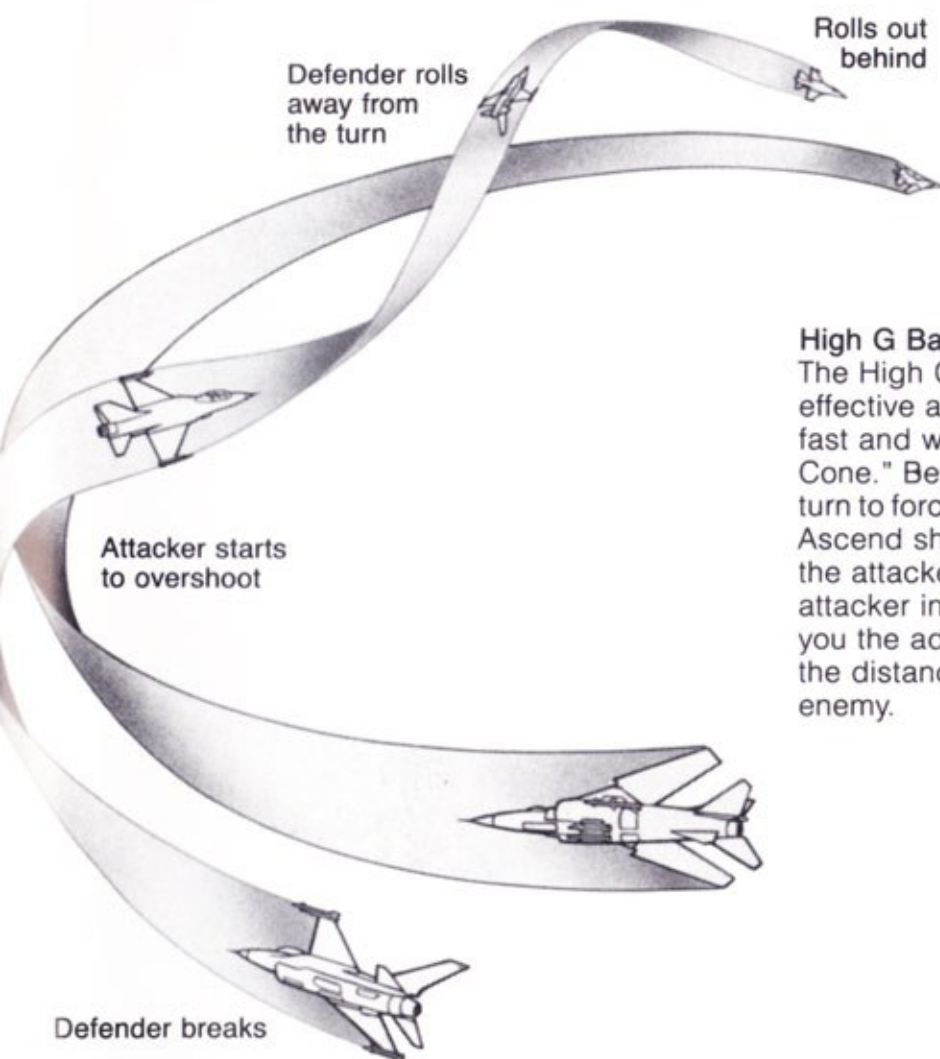
Defender breaks

Defender reverses

Attacker overshoots

Defensive Moves

Your best defense against enemy aircraft is the Harrier's ability to perform quick ascents and descents (VIFFing). Another defensive maneuver is the reverse, in which you roll out, or in some way deviate from a straight line, thereby reducing your forward velocity and causing your attacker to fly past you. If



High G Barrel Roll

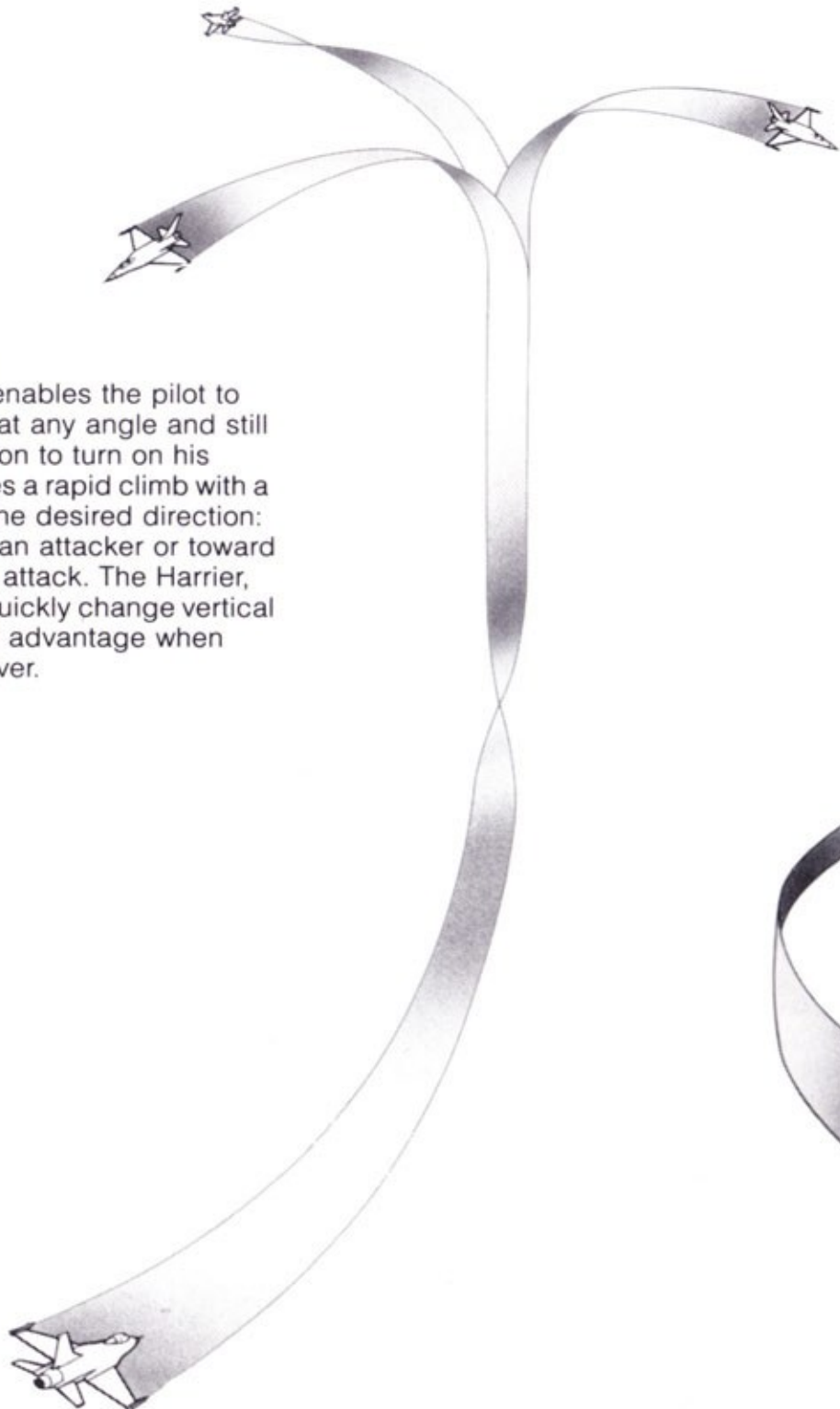
The High G Barrel Roll can be very effective against an attacker closing fast and within your "Vulnerability Cone." Begin with a Defensive Break turn to force the attacker to fly past you. Ascend sharply; then roll back toward the attacker. This will not only force the attacker in front of you, but also give you the added velocity needed to cut the distance between you and the enemy.



you are having a lot of trouble shaking a pursuer, you can try "jinking"—altering your course repeatedly so that the enemy cannot target you in his sights. The maneuvers described below involve a combination of VIFFing and "jinking" techniques.

The Immelmann

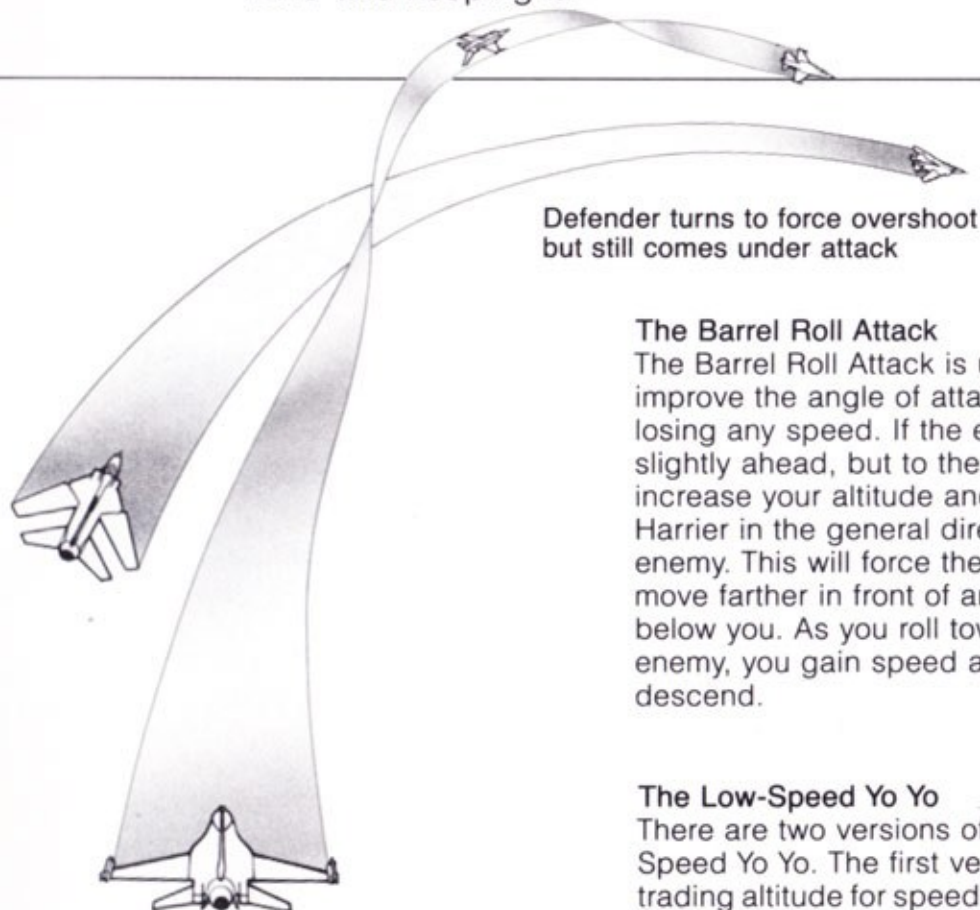
The Immelmann enables the pilot to reposition his jet at any angle and still remain in a position to turn on his attacker. It involves a rapid climb with a sharp roll out in the desired direction: either away from an attacker or toward the enemy for an attack. The Harrier, with its ability to quickly change vertical direction, has the advantage when using this maneuver.



Defender
breaks
hard

Offensive Moves

The objective is to keep the enemy aircraft in front of you and within firing range. Remember, the enemy has access to the same evasive and counter-attack measures as you! Your success in combat depends on your skill in getting the upper hand and keeping it.



Defender turns to force overshoot but still comes under attack

The Barrel Roll Attack

The Barrel Roll Attack is used to improve the angle of attack without losing any speed. If the enemy is slightly ahead, but to the side of you, increase your altitude and roll the Harrier in the general direction of the enemy. This will force the enemy to move farther in front of and slightly below you. As you roll toward the enemy, you gain speed as you descend.

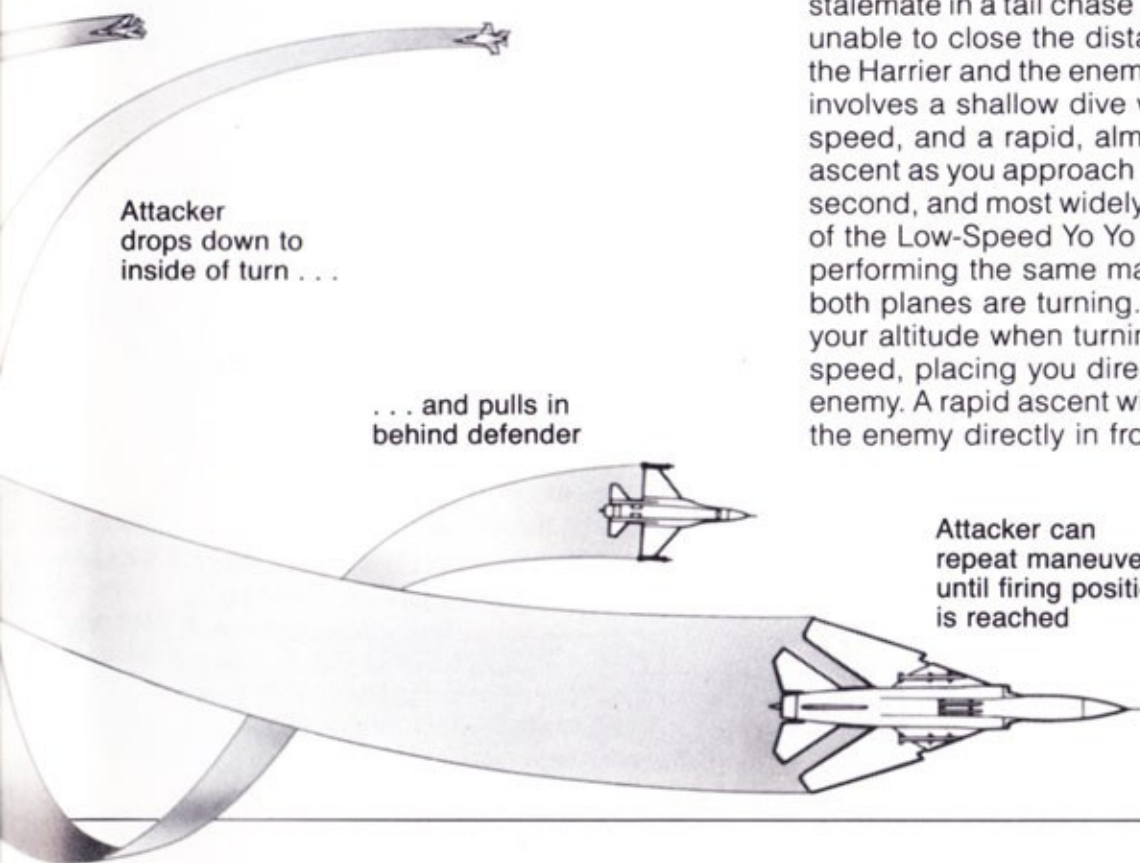
The Low-Speed Yo Yo

There are two versions of the Low-Speed Yo Yo. The first version involves trading altitude for speed in the pursuit of the enemy. It is used to break a stalemate in a tail chase where you are unable to close the distance between the Harrier and the enemy's plane. This involves a shallow dive where you gain speed, and a rapid, almost vertical, ascent as you approach the enemy. The second, and most widely used, version of the Low-Speed Yo Yo involves performing the same maneuver while both planes are turning. As you drop your altitude when turning you gain speed, placing you directly below the enemy. A rapid ascent will then position the enemy directly in front of you.

Attacker drops down to inside of turn . . .

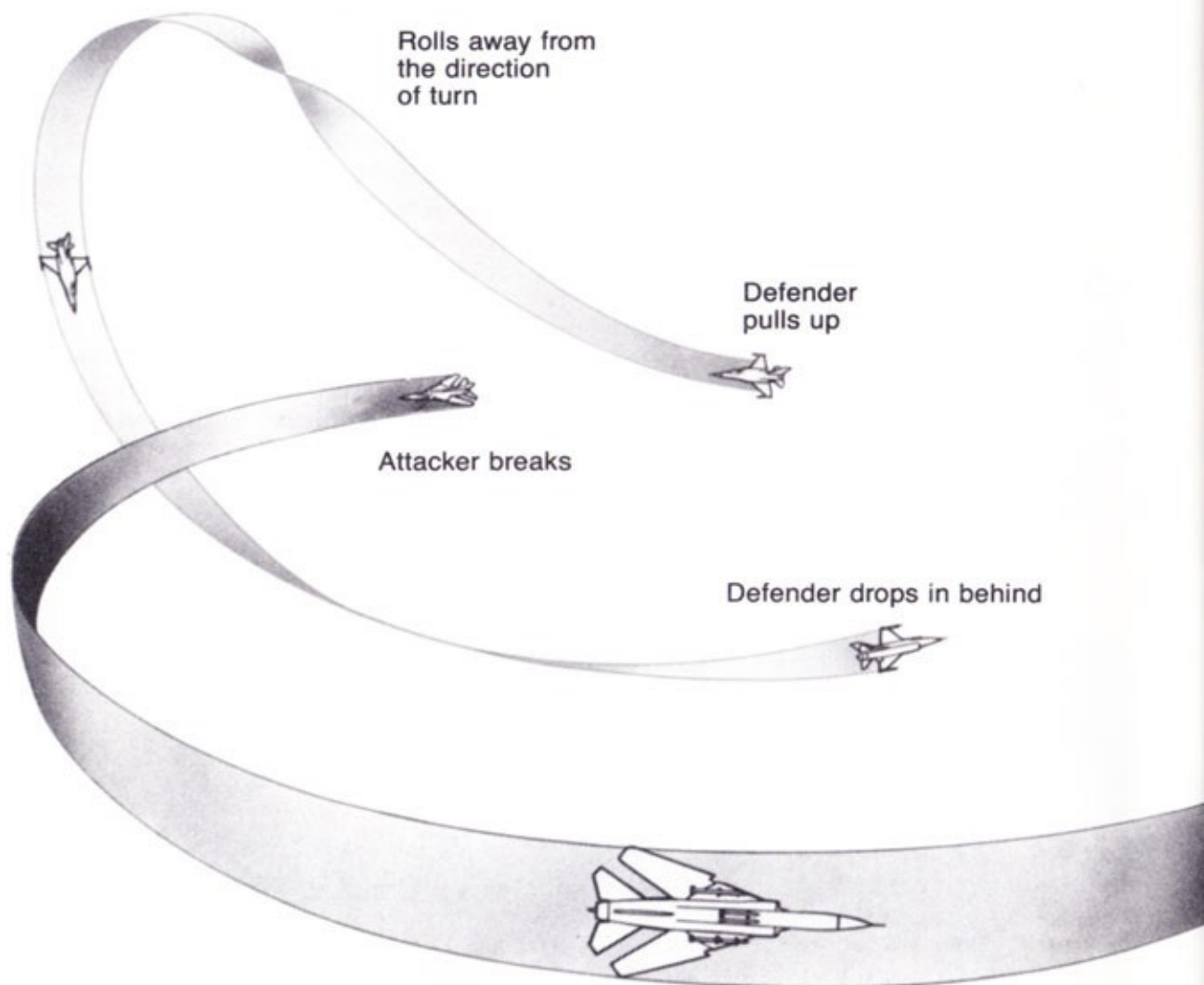
. . . and pulls in behind defender

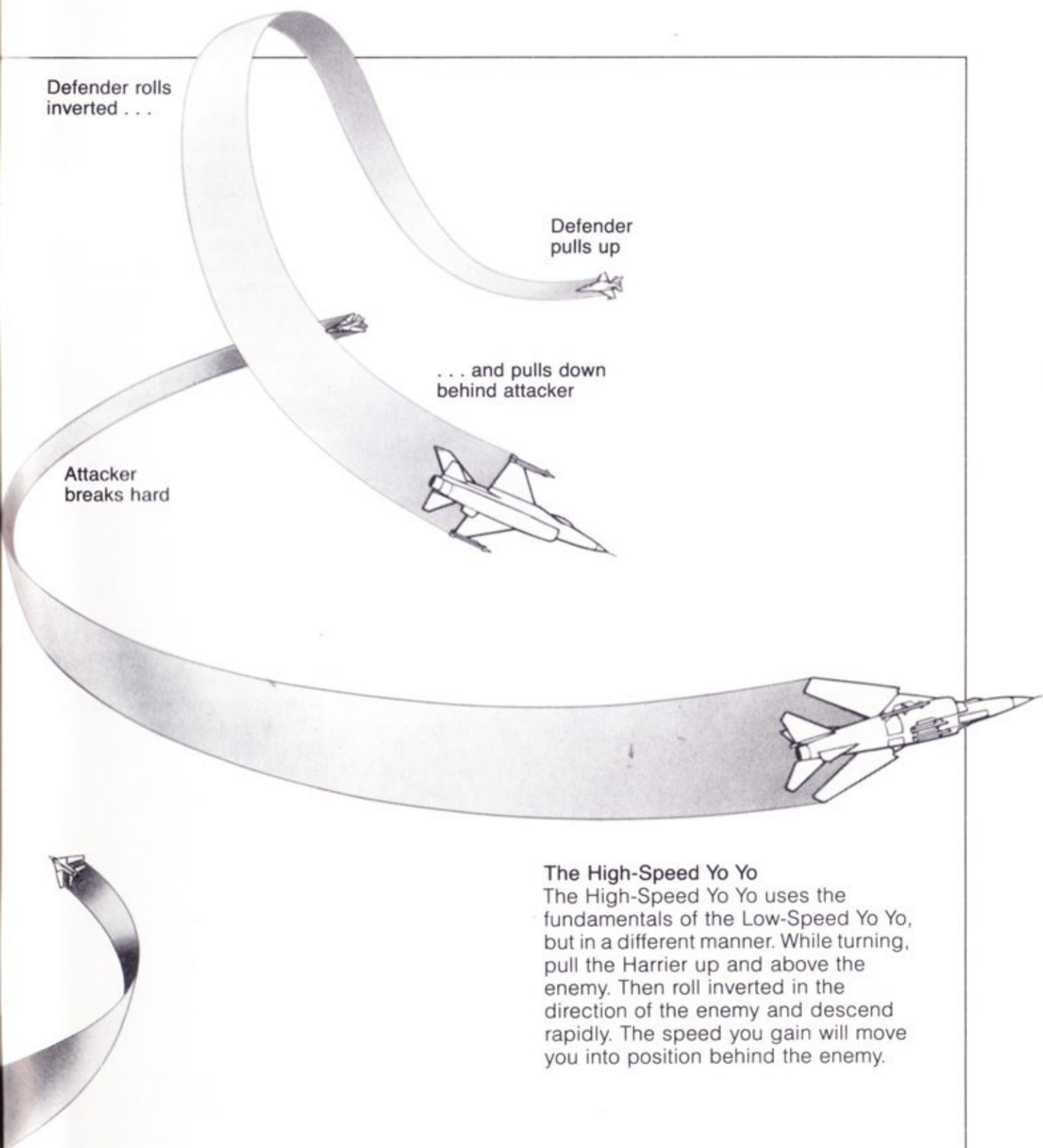
Attacker can repeat maneuver until firing position is reached



The Rollaway

The Rollaway, sometimes known as the vector roll, is a variation on the High-Speed Yo Yo. This maneuver is useful in correcting a potential overshoot situation. While the enemy is performing a tight turn, increase the Harrier's altitude and roll hard in the direction opposite the enemy's turn. The result will be that upon coming out of the roll, you are headed in the direction of the enemy's plane.





The diagram illustrates the High-Speed Yo Yo maneuver using a continuous grey ribbon that loops through the sky. At the bottom right, a fighter jet (the attacker) is shown in a steep climb, following the start of the ribbon. The ribbon curves upwards and to the left, then loops back down and to the right. In the middle of this loop, another fighter jet (the defender) is shown in a steep descent, following the ribbon. The ribbon continues to curve upwards and to the left, then loops back down and to the right, ending with a third fighter jet (the defender) in a steep climb. The attacker's path is indicated by the ribbon's trajectory, showing how it moves from behind the defender to a position behind the defender again.

Defender rolls inverted . . .

Defender pulls up

. . . and pulls down behind attacker

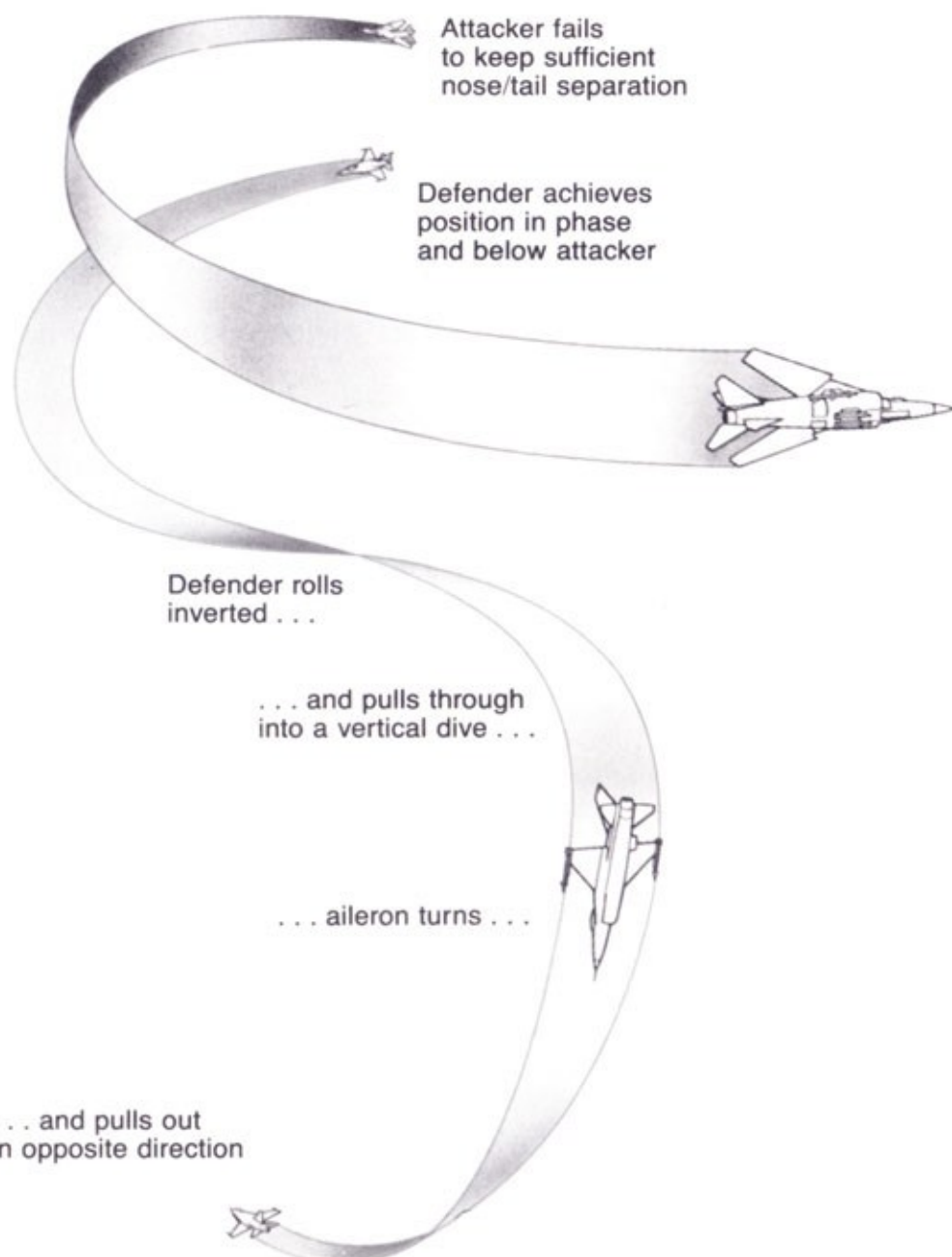
Attacker breaks hard

The High-Speed Yo Yo

The High-Speed Yo Yo uses the fundamentals of the Low-Speed Yo Yo, but in a different manner. While turning, pull the Harrier up and above the enemy. Then roll inverted in the direction of the enemy and descend rapidly. The speed you gain will move you into position behind the enemy.

The Split S

The Split S is a maneuver used for evading attack when the attacker is directly above you, but has not yet positioned himself directly behind you. After a quick descent, roll inverted and pull through into a vertical dive. Turn sharply and pull out in the opposite direction of the attacker.



The Long Toss

This is an attack maneuver against ground forces. Releasing a bomb while flying directly over your target can be dangerous. The Long Toss involves pulling your Harrier up quickly while releasing a bomb. The result of this maneuver is that the bomb is "tossed" from the plane, and the Harrier can escape quickly from heavily guarded areas.

Figure 1 A Typical Mission

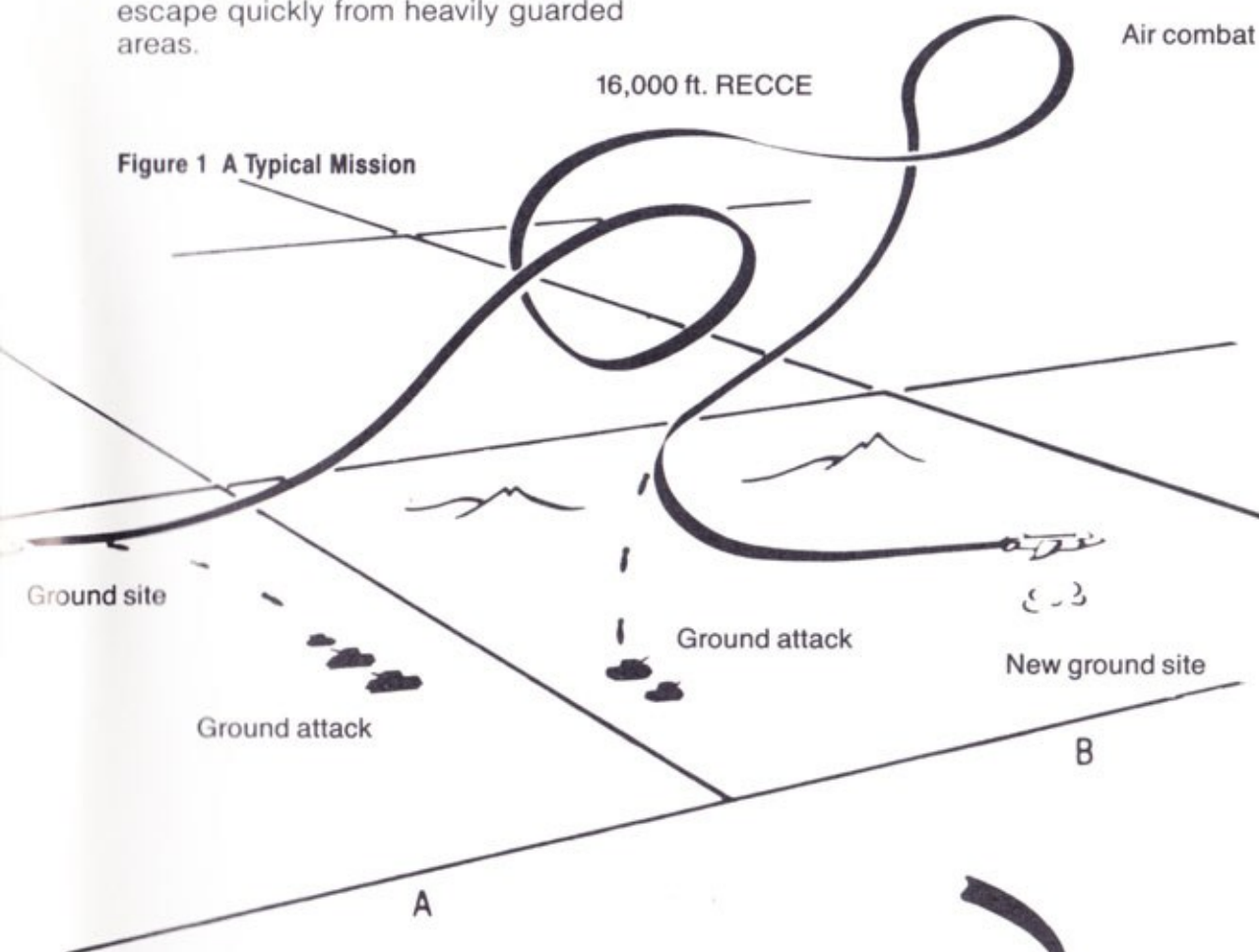


Figure 2 Long Toss Technique





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